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SUBJECT: Submits addl info on standby shutdown facility reactor coolant makeup pump test.Attachment 1 contains summary of results of flow distribution test on Unit 2 standby shutdown facility reactor coolant makeup pump.

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August 25, 1998

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Subject: Oconee Nuclear Station
Docket Nos. 50-270
Additional Information on the Standby Shutdown Facility Reactor Coolant Makeup Pump Test

In a letter dated July 8, 1996, the NRC issued for comment draft reports from the Office of Nuclear Reactor Regulation (NRR) and the Office for Analysis and Evaluation of Operational Data (AEOD). These draft reports contained analyses and recommendations regarding the testing, operation, design and reliability of the Oconee emergency power system and Standby Shutdown Facility (SSF). As requested in the July 8, 1996, NRC letter, Duke Energy reviewed the NRR and AEOD draft reports for accuracy and to determine a disposition for each recommendation.

In a meeting with the NRC on September 19, 1996, Duke Energy presented its understanding of the open issues and recommendations from the NRC draft reports, along with Duke Energy's plan for disposition of the issues. During the meeting, the NRC clarified Duke Energy's understanding of several of the open issues. A written response to the open issues and recommendations was provided by Duke Energy in a letter dated October 31, 1996.

In the Duke Energy letter dated October 31, 1996, Duke Energy committed to the performance of a flow distribution test on the SSF reactor coolant makeup pump for each Oconee unit. During the last Oconee Unit 2 refueling outage, a flow distribution test was performed on the Oconee Unit 2 SSF reactor coolant makeup pump. Attachment 1 contains a summary of the results of the flow distribution test on the Oconee Unit 2 SSF reactor coolant makeup pump. In addition, Attachment 2 provides the technical justification for the utilization of the Oconee Unit 1 and 2 SSF reactor coolant

makeup pump test data to justify an acceptable makeup flow distribution for the Oconee Unit 3 reactor coolant pumps. Thus, the SSF reactor coolant makeup pump flow distribution test will not be performed during the upcoming Unit 3 refueling outage.

If there are any questions regarding this submittal, please contact Michael Bailey at (864) 885-4390.

Very truly yours,

W. R. McCollum, Jr., Site Vice President
Oconee Nuclear Station

MEB

Attachments

cc:

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Results of Standby Shutdown Facility Reactor Coolant Makeup Pump Flow Distribution Test For Oconee Unit 2

Test Purpose

The one-time test would determine if the flow rate provided by the Standby Shutdown Facility (SSF) reactor coolant (RC) makeup system to each of the four Oconee Unit 2 RC pumps is adequate to prevent seal degradation or failure during an accident which requires operation of the SSF RC makeup system.

Acceptance Criteria

The flow rate provided to each RC pump during the flow distribution test shall be greater than or equal to the flow rate listed below:

1. Flow to 2A1 RC pump $\geq$ 3.7 GPM (3.35 GPM + 0.32 GPM uncertainty)
2. Flow to 2A2 RC pump $\geq$ 3.7 GPM (3.35 GPM + 0.32 GPM uncertainty)
3. Flow to 2B1 RC pump $\geq$ 3.7 GPM (3.35 GPM + 0.32 GPM uncertainty)
4. Flow to 2B2 RC pump $\geq$ 3.7 GPM (3.35 GPM + 0.32 GPM uncertainty)

Test Method

The Oconee Unit 2 SSF RC makeup pump was used to inject water from the Spent Fuel Pool to the four RC pumps via the RC pump seal injection lines. The testing was performed while Oconee Unit 2 was at cold shutdown conditions. While testing at cold shutdown conditions, the back pressure that is present at the point of seal injection will be essentially RC system pressure. Since the back pressure during the test was essentially RC system pressure, the flow distribution which was measured during the test will be the same flow distribution which will be present during an accident that requires operation of the SSF RC makeup system. During the SSF RC makeup pump flow distribution test, the level in the RC system was maintained high enough to ensure that the back pressure at each RC pump was equal.

In order to measure the SSF RC makeup system flow rate to each RC pump, an ultrasonic flow meter was attached to the seal injection line for each of the four RC pumps. A similar test was performed on Oconee Unit 1 utilizing both ultrasonic flow meters and Mag meters to measure the seal injection flow. The use of the Mag

meters required installation of the Mag meters by temporarily replacing a section of the seal injection piping with a spool piece containing the Mag meters. Oconee Units 2 and 3 are equipped with Bingham RC pumps which require a lower seal injection flow rate than the Westinghouse RC pumps which are installed on Oconee Unit 1. Since the required seal injection flow rates for the Oconee Unit 2 RC pumps are lower than Oconee Unit 1, the accuracy of the ultrasonic flow meters is acceptable for determining the seal injection flow rate.

Results

The following seal injection flow rates were measured during the SSF RC makeup system flow distribution test.

RC Pump	Ultrasonic Flow Rate (GPM)
2A1	7.4
2A2	6.9
2B1	11.5
2B2	5.0
Total	30.8

Conclusion

Based on an inspection of the Oconee Unit 2 SSF RC makeup system piping and fittings, the flow rate provided by the Oconee Unit 2 SSF RC makeup system to each RC pump is not expected to be evenly split. The length of 3/4" pipe and the number of 3/4" fittings present in each seal injection flow path significantly affects the flow rate provided to each RC pump.

Since the 2B1 RC pump has no 3/4" 90 degree elbows and the length of 3/4" pipe that is installed in the seal injection line to 2B1 RC pump is less than the length of 3/4" pipe installed in the other seal injection lines, the 2B1 RC pump is expected to receive the largest seal injection flow rate. This prediction agrees with performance test data listed in the test results section above. Similarly, the seal injection flow path with the most 3/4" 90 degree elbows and length of 3/4" pipe is the 2B2 RC pump seal injection line which received the lowest seal injection flow rate during the flow distribution testing.

The Oconee Unit 2 SSF RC makeup system flow paths to the RC pumps are listed below (in order of least restrictive to most restrictive). A flow path is determined to be less or more restrictive based on the length of 3/4" pipe and the number of

3/4" fittings which are installed in a flow path. The seal injection flow rates measured during the Oconee Unit 2 SSF RC makeup system flow distribution test are also listed.

RC Pump	Flow Balance Test Results
2B1	11.5 GPM
2A1	7.4 GPM
2A2	6.9 GPM
2B2	5.0 GPM

Since the results of the SSF RC makeup pump flow distribution test agree with the results that were determined based on a review of SSF RC makeup system pipe flow resistance, the results of the Oconee Unit 2 SSF RC makeup system flow balance test are expected.

In addition, the flow rates that are provided through each seal injection line are greater than the acceptance criteria. Therefore, the SSF RC makeup system is capable of providing enough flow to each of the four Oconee Unit 2 RC pumps to prevent seal degradation or failure during an accident which requires operation of the SSF RC makeup system.

Oconee Unit 3
SSF RC Makeup System
Flow Distribution Test

The flow distribution testing of the Oconee Unit 1 and 2 Standby Shutdown Facility (SSF) reactor coolant (RC) makeup systems has indicated that adequate seal injection flow would be provided to protect the RC pump seals during an accident which requires operation of the SSF RC makeup system. The following information provides the justification which indicates that a test of the Oconee Unit 3 SSF RC makeup system is not necessary.

Oconee Units 2 and 3 are supplied with the same type of Bingham reactor coolant pump seals. In addition, the SSF RC makeup system design for Oconee Unit 3 is similar to the Oconee Unit 2 SSF RC makeup system design. Thus, the flow distributions for Oconee Unit 3 should not be significantly different from the flow distributions that were observed during the SSF RC makeup system flow testing on Oconee Unit 2.

By normal plant operation, the portion of the Oconee Unit 3 SSF RC makeup system seal injection lines that are shared with the HPI seal injection lines are verified to be unobstructed. During each refueling outage, a connection which is located upstream of the individual RC pump seal injection lines is used to pump demineralized water through the portions of the SSF RC makeup system seal injections that are not shared with the HPI seal injection lines. The combination of the above two activities ensures that the SSF RC makeup system is capable of providing seal injection flow to protect the RC pump seals.

Additional flow testing of the SSF RC makeup system piping that is located upstream of each individual seal injection line is performed quarterly when the Oconee Unit 3 SSF RC makeup pump is tested. This ensures that the piping which is located upstream of the SSF RC makeup pump and the piping which is located between the Oconee Unit 3 SSF RC makeup pump and the SSF RC makeup system test line connection is unobstructed. The only piping which is not verified to be unobstructed is located between the branch connection to the SSF RC makeup system test line and the branch line containing valve 3HP-406. Since this portion of the SSF RC makeup system is located upstream of the branch lines which feed each individual RC pump, the flow resistance through this section of piping will not affect the flow distribution that is provided to each RC pump.

Adequate flow distribution of the Oconee Unit 3 SSF RC makeup system to the RC pumps is predicted by the KY pipe flow model. The

following table indicates the predicted flow distribution and the required minimum flow for the Oconee Unit 3 RC pumps.

RC Pump	KY Pipe Model Flow Rate (GPM)	Minimum Required Flow Rate (GPM)
3A1	6.3	3.35
3A2	8.4	3.35
3B1	8.5	3.35
3B2	5.8	3.35

Since the minimum required flow rate is 3.35 GPM for each RC pump, the actual SSF RC makeup system flow rate would need to be 2.45 GPM less than the lowest predicted flow rate before the flow distribution would become inadequate. Since the testing which is discussed above indicates that no significant flow blockage is present in any of the individual Oconee Unit 3 SSF RC makeup system seal injection lines, it is unlikely that the actual flow rate which is delivered to the RC pump seals is significantly less than the flow rate that is predicted by the flow model.

Currently, there is no KY pipe flow model for the Oconee Unit 2 SSF RC makeup system. In the past, the Oconee Unit 3 flow model was used to justify that the Oconee Unit 2 SSF RC makeup system is capable of providing adequate flow. Since Oconee Unit 1 is the only unit which has a flow model and flow distribution test data, the Oconee Unit 1 KY pipe flow model results were compared to the Oconee Unit 1 flow distribution test results. The comparison of the Oconee Unit 1 flow distribution test results to the KY flow model results indicates that the model can adequately predict the SSF RC makeup system flow distribution. The following table provides a comparison of the flow rates which were measured by the Mag meters during the Oconee Unit 1 flow distribution test and the KY flow model results. A comparison to the Oconee Unit 1 test data from the Mag meters was performed since the Mag meters are more accurate than the ultrasonic flow meters.

RC Pump	KY Flow Model Flow Rate (GPM)	Actual Flow Rate (GPM)	Difference (GPM)
1A1	7.7	8.6	-0.9
1A2	6.3	6.3	0.0
1B1	7.0	8.4	-1.4
1B2	8.0	6.7	1.3

As can seen by the above comparison, the largest difference between the KY flow model flow rate and the actual flow rate from the Oconee Unit 1 flow distribution test was 1.4 GPM. A variation

of the actual RC pump seal injection flow rates by 1.4 GPM from the predicted flow rates would still provide adequate flow to the RC pump seals on Oconee Unit 3. Based on the results of the above comparison, it is reasonable to assume that the Oconee Unit 3 KY flow model will provide an accurate prediction of the flow rate provided to each of the Oconee Unit 3 RC pumps.

The information that is contained in this attachment indicates that 1) the Oconee Unit 2 and 3 RC pump seals are of the same type, 2) the Oconee Unit 2 and 3 RC pump seals have similar flow rate requirements, 3) the Oconee Unit 3 SSF RC makeup system piping is verified to be unobstructed, 4) the KY flow model indicates adequate flow will be distributed to each RC pump, and 5) the KY flow model can adequately predict the flow rates of the Oconee SSF RC makeup system. Based on the above information, it can be concluded that adequate flow distribution for the Oconee Unit 3 SSF RC makeup system is available and no flow distribution testing is necessary. Therefore, Oconee does not intend to perform the SSF RC makeup system flow distribution testing on Oconee Unit 3, as committed in the October 31, 1996, letter from Duke to the NRC.